JLCA Corner

Launch of the Damage Function Sub-Committee in the National LCA Project of Japan

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1 Objective

LCIA (Life Cycle Impact Assessment) aims at examining the product system from an environmental perspective using impact categories and resource issues for one or more product systems (ISO/FDIS14042, 1999). In characterization phase, we have to select characterization factors to convert the assigned LCI results to common units. In most cases, these characterization factors relate LCI with the category midpoints such as infrared radiative forcing and proton release, but not with category endpoints like the decrease of forest.

These indicators are useful to evaluate the potential impacts of corresponding impact category. However, a lot of category endpoints are involved in one impact category like greenhouse effects. Comparing between category midpoints may prove to be more inconvenient than between category endpoints because of the lack of the depth of assessment if we consider the comparison across an impact category like weighting. Several approaches have been developed with the consideration of priority between safeguarding subjects such as Eco-indicator'99 (GOODKOOP, 1999), EPS (STEHEN, 1996) and ExternE (MAYERHOVER, 1997). One of the most important and difficult problems to improve these methodologies is to establish the quantifying damage of category endpoints through the emission of environmental loading substances with a high quality based on natural sciences, a feature which we call 'damage function'. Results of these studies may provide useful information and contribute to an improvement in most of the damage-oriented impact assessment methodologies.

The national LCA project of Japan gathered the specialists of the impact assessment at every impact category and launched the damage function sub-committee under the impact assessment committee to relate LCI with the damage of category endpoints.

2 Approach for the Investigation

Step 1: Establishment of a Cause-Effect Chain
To obtain the reliable damage functions, it is essential to make clear the mechanism of environmental problems. As a first step of this sub-committee, we consider identifing the cause-effect chain in each impact category that addresses the relationships between the emission of environmental loading substances, midpoints and category endpoints in detail. These relationships will be a basis for investigations of the definition of category endpoints and the procedure for the consideration of damage functions.

Step 2: Determination of category endpoints for assessment
There are a lot of category endpoints for every individual impact category. It is impossible to quantify the damage for all of the category endpoints, so that we must prioritize the category endpoints and select those which should be investigated based on a cause-effect chain.

Step 3: Quantified characterization of the relationships between each midpoint
From the cause-effect chain, we can describe the mechanism of environmental problems for assessment. In this step, we consider characterizing the relationships between the midpoints using knowledge of the natural sciences.

Step 4: Establishment of damage function
Through the integration of the relationships between midpoints in former processes, our goal is to develop the damage functions which demonstrate the relationship of the emission from the inventory table with the damage of category endpoints.

3 Organization and Members

The damage function sub-committee is composed of specialists in impact assessment for every environmental problem and contributors from LCIA. This fiscal year, we will be handling greenhouse effects, acidification, eutrophication, photochemical oxidant formation, human toxicity and eco-toxicity. The members of this subcommittee are listed below.

4 Periods

From April 1999 to March 2000: Investigation of basic data for the development of damage functions (previous step), Establishment of a cause-effect chain (step 1), Preliminarily establishment of damage functions for several category endpoints (parts of step 2-4)

From April 2000 to March 2001: Establishment of damage functions and consideration of reliability and uncertainty of them (step 2-4)

Several results of this fiscal year will be published in the 4th international conference on Ecobalance in Tsukuba, Japan.

References

GOODKOOP, M.; SPRIENSMA, R. (1999): The Eco-indicator 99: A damage oriented method for Life Cycle Impact Assessment. Methodology Report

ISO/FDIS14042 (1999): Environmental management – Life cycle assessment – Life cycle impact assessment

MAYERHOVER, P.; KREWITT, W.; FRIEDRICH, R. (1997): ExternE: Core project. Extension of the Accounting Framework. Final Report, The European Commission

STEEN, B. (1996): EPS-Default Valuation of Environmental Impacts from Emission and Use of Resources, Version 1996

Name	Affiliation	Field
Atsushi INABA (chair-person)	National Institute for Resource and Environment	LCIA
Yasunari MATSUNO	National Institute for Resource and Environment	LCIA
Toshio FUROTA	Toho University	Eutrophication
Masanori OKAZAKI	Tokyo University of Agriculture & Technology	Acidification
Hiroshi SEINO	National Institute of Agro-Environmental Sciences	Greenhouse effects
Toshimasa OHARA	Shizuoka University	Photochemical oxidant formation
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